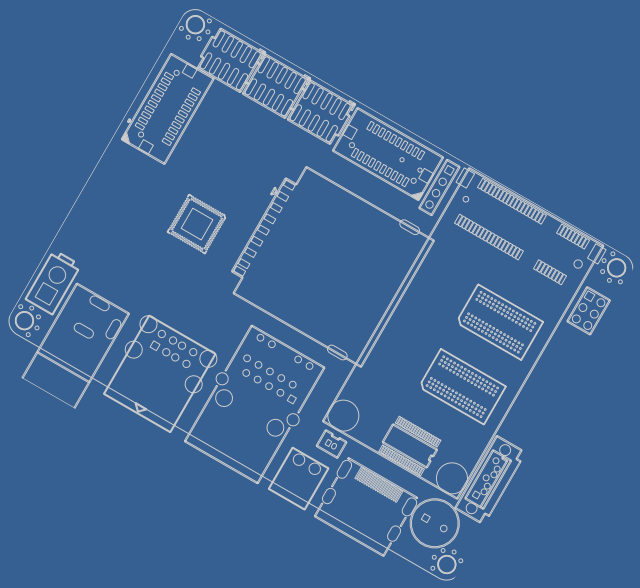
User Manual

Ver. 1st



EMBUX · 安博科技

# ICM-2010 Series

2.5’’ SBC with Freescale i.MX6 Processor

ARM ® Cortex A9 Architecture

# Copyright

Copyright ©2015 EMBUX Technology Co., Ltd., All rights reserved.
EMBUX Technology Co., Ltd. reserves the right to make improvements in the products described in this manual at any time without notice. No part of this manual may be reproduced, copied, translated or transmitted in any form or by any means without prior written permission of EMBUX Technology Co., Ltd.

# Trademark

The EMBUX logo is a registered trademark of EMBUX Technology Co., Ltd.
All other trademarks or registered marks in this manual belong to their respective manufacturers.

# Disclaimer

Information in this document is subject to change without notice and does not represent a commitment on the part of EMBUX.

EMBUX provides this document as is, without warranty of any kind, either expressed or implied, including, but not limited to, its particular purpose. EMBUX reserves the right to make improvements and/or changes to this manual, or to the products and/or the programs described in this manual, at any time.

Information provided in this manual is intended to be accurate and reliable. However, EMBUX Technology Co., Ltd. assumes no responsibility for its use, nor for any infringements of the rights of third parties, which may result from its use.

This product might include unintentional technical or typographical errors.
Changes are periodically made to the information herein to correct such errors, and these changes are incorporated into new editions of the publication.

# Declaration of Conformity

**FCC Class B**

Note: this device has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This device generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communication. However, there is no guarantee that interference will not occur in a particular in a particular installation. If this device does cause harmful interference to radio or television reception, which can be determined by turning the device off and on, the user is encouraged to try to correct the interference by one or more of following measures:

- Reorient or relocate the receiving antenna
- Increase the separation between the device and receiver
- Connect the device into an outlet on a circuit different from that to which receiver is connected
- Consult the dealer or an experienced radio/TV technician for help

**CE Marking**

This device has passed the CE test for environmental specifications when shielded cables are used for external wiring. We recommend the use of shielded cables.
This device has passed the CE test for environmental specifications. Test conditions for passing included the equipment being operated within an industrial enclosure. In order to protect the product from being damaged by ESD (Electrostatic Discharge) and EMI leakage, we strongly recommend the use of CE-compliant industrial enclosure products.

# Document Amendment History

| Revision | Date | Remark |
|---|---|---|
| 1st | May 2015 | Initial released |
| 2nd | May 2015 | Modify RS-232 (JCOM1) description from full pins to 2 pins function |

# Table of Contents

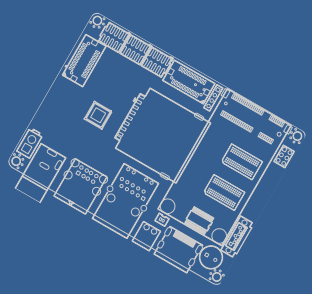

1. Product Overview ..... 8
    1.1. Introduction ..... 8
    1.2. Specification ..... 8
    1.3. Block Diagram ..... 10
2. Hardware User Guide ..... 12
    2.1. Jumper and Connector Locations ..... 12
    2.2. Jumper ..... 13
        2.2.1. Jumper Description ..... 13
        2.2.2. Jumper List ..... 13
        2.2.3. Jumper Setting ..... 13
    2.3. Connector ..... 14
        2.3.1. Connector List ..... 14
        2.3.2. Connector Setting ..... 14
            2.3.2.1. RS-485 ..... 14
            2.3.2.2. JCOM1 ..... 15
            2.3.2.3. JDC in ..... 15
            2.3.2.4. JEMBUX ..... 15
            2.3.2.5. JFP ..... 16
            2.3.2.6. JI2C ..... 16
            2.3.2.7. JLVDS ..... 16
            2.3.2.8. JMISC ..... 16
            2.3.2.9. JRS-485 ..... 17
            2.3.2.10. JSIM ..... 17
    2.4. Mechanism ..... 17
        2.4.1. Board Dimension ..... 17
3. Software User Guide ..... 19
    3.1. Introduction ..... 19
    3.2. Setup Build Environment ..... 19
        3.2.1. Installing and build ..... 19
        3.2.2. Download source code and checkout the latest version ..... 20
        3.2.3. Build and Flashing the SD card ..... 20
    3.3. Create SD/MMC Card using Linux Host ..... 21
        3.3.1. Requirements ..... 21
        3.3.2. Copying the Boot loader Image ..... 21
        3.3.3. Copying the Kernel Image ..... 22
        3.3.4. Copying the Root File System (rootfs) ..... 22

3.4. Applications and Testing ..... 23
3.4.1. Ethernet Test ..... 23
3.4.2. USB ..... 24
3.4.3. SD ..... 24
3.4.4. I2C ..... 24
3.5. Create a Virtual Machine Environment ..... 25
3.5.1. Introduction ..... 25
3.5.2. Setting up work environment ..... 25
4. System Recovery ..... 29
4.1. Download the SD image ..... 29
4.2. Write an SD/MMC Card using Linux (Ubuntu) ..... 29
4.3. Write an SD/MMC Card using Windows ..... 30
4.3.1. Introduction ..... 30
4.3.2. Preparations ..... 30
4.3.3. Create SD-Card ..... 30
4.4. Write an SD/MMC Card using MAC OS X ..... 31
4.4.1. graphical interface ..... 31
4.4.2. Command line ..... 32
4.4.3. Alternative method ..... 32

# Chapter 1

## Product Overview

This chapter provides background Information of SBC.



# 1. Product Overview

## 1.1. Introduction

ICM-2010 is a 2.5'' SBC (Single Board Computer) with ARM Cortex-A9 Freescale i.MX6 DualLite (Solo / Quad by request) 1GHz processor and ARM Cortex™-M0 32-bit RISC core (MCU). The ICM-2010 can support 1GB DDR3 and 8MB onboard NOR Flash, LVDS, HDMI display, 1 Gigabit LAN with IEEE 1588, 3 USB 2.0, 1 micro USB type B (device mode only), 1 RS-232, 1 RS-485, 1 CAN, 1 SATA II, 1 Full size mini PCIe, 1 SD and SIM (header).

Integrated unique dual hardware structure and RTOS (real time operating system) design, ICM-2010 has outstanding crash free protection on both hardware reliability and software stability. With the special features, ICM-2010 is a perfect device to meet customers' versatile needs.

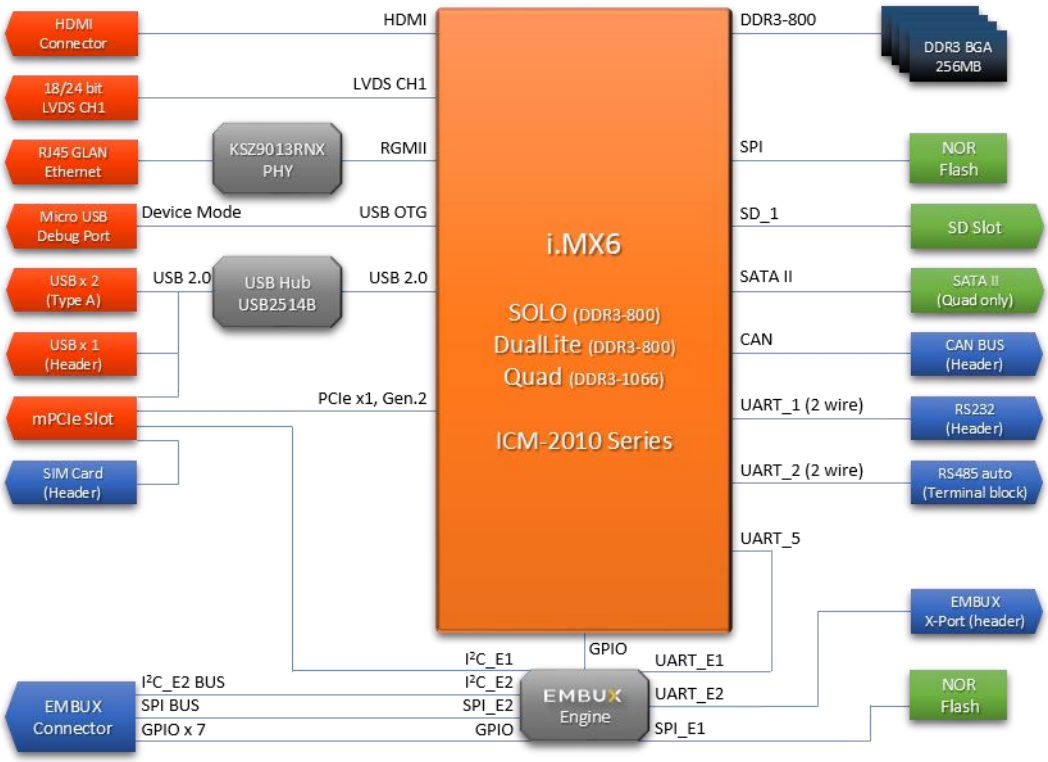
The ICM-2010 focuses on single application and it provides high performance and low power consumption from its ARM ® Cortex A9 architecture which is ready-to-run, compact, and easy-to-expand. With flexible I/O interfaces and complete hardware and software solutions, ICM-2010 is a fast time-to-market platform for customers to develop their applications and products easily.

## 1.2. Specification

| System Hardware - CPU | | |
|---|---|---|
| **CPU** | | Freescale i.MX6 Cortex-A9 DualLite (Solo/Quad sku by request) |
| **Memory** | Technology | DDR3-800 (800/1066 MHz for Solo/Quad by request) |
| | Capacity | Onboard 1GB (512MB/1GB for Solo/Quad by request) |
| | Flash | 8MB NOR Flash |
| **Graphic** | HDMI | 1 x HDMI connector |
| | LVDS | 1 x 18/24 bit LVDS header (2x10 1.25mm Hirose DF13 series compatible) |
| **Watchdog Timer** | | 1~256 level (second) |
| **RTC** | | EPSON RX8010SJ RTC chip |
| **Indicator** | LED | 1 x configurable indicator controlled by MCU<br>1 x configurable indicator controlled by i.MX6 |
| **I/O** | LAN | 1 x Micrel KSZ9031RNX Gigabit Ethernet |
| | USB | 1 x USB (miscellaneous header)<br>1 x 2 ports USB (double-deck connector) |
| | USB OTG | 1 x micro USB type B (device mode only) |
| | Serial Port | 1 x RS-232 header (2x5 2.0mm pin header)<br>1 x RS-485 (1x2 3.5mm terminal block) |
| | CAN | 1 CAN bus header (miscellaneous header) |

| | | |
|---|---|---|
| | GPIO | 9 x GPIO via MCU |
| | Button | 1 x power-on button<br>2 x configurable buttons |
| **Expansion** | Full size mini PCIe | x 1 |
| | SATA | 1 x SATA II port (Quad model only) |
| | SD socket | x 1 |
| | SIM slot | 1 x SIM card header |
| **System Hardware - MCU** | | |
| **MCU** | | STM32F051R8T6 |
| **Memory** | Flash | 8MB NOR Flash |
| **I/O** | EMBUX X Port | 1 x EMBUX X Port (miscellaneous header) |
| | I2C | 1 x I2C interface (2x10 1.25mm Hirose DF13 series compatible, shared with SPI and GPIO) for Mainboard MCU to accessory (i.e OLED module) connection purpose |
| | SPI | 1 x SPI interface (2x10 1.25mm Hirose DF13 series compatible, shared with I2C and GPIO) for Mainboard MCU to accessory (i.e OLED module) connection purpose |
| | GPIO | 7-bit GPIO (2x10 1.25mm Hirose DF13 series compatible, shared with SPI and I2C) for Mainboard MCU to accessory (i.e OLED module) connection purpose |
| **System Software** | | |
| **Operation System** | Linux | Embedded Linux 3.0.35 |
| | Android | Jelly Bean 4.3 |
| **Environment & Mechanism** | | |
| **Temperature** | Operation temperature | 0~60° C |
| **Humidity** | Operation humidity | 5%~95% Relative Humidity, non-condensing |
| **Mechanical** | Dimension | PICO-ITX (100mm X 72mm) |
| **Power** | DC-input | 5V (4.75V~5.25V) |
| | Control | Power on by DC attached or via power button. |
| | Consumption | ~3W |

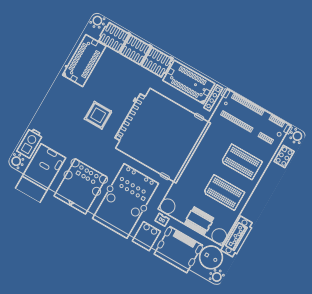
## 1.3. Block Diagram



# Chapter 2

## Hardware User Guide

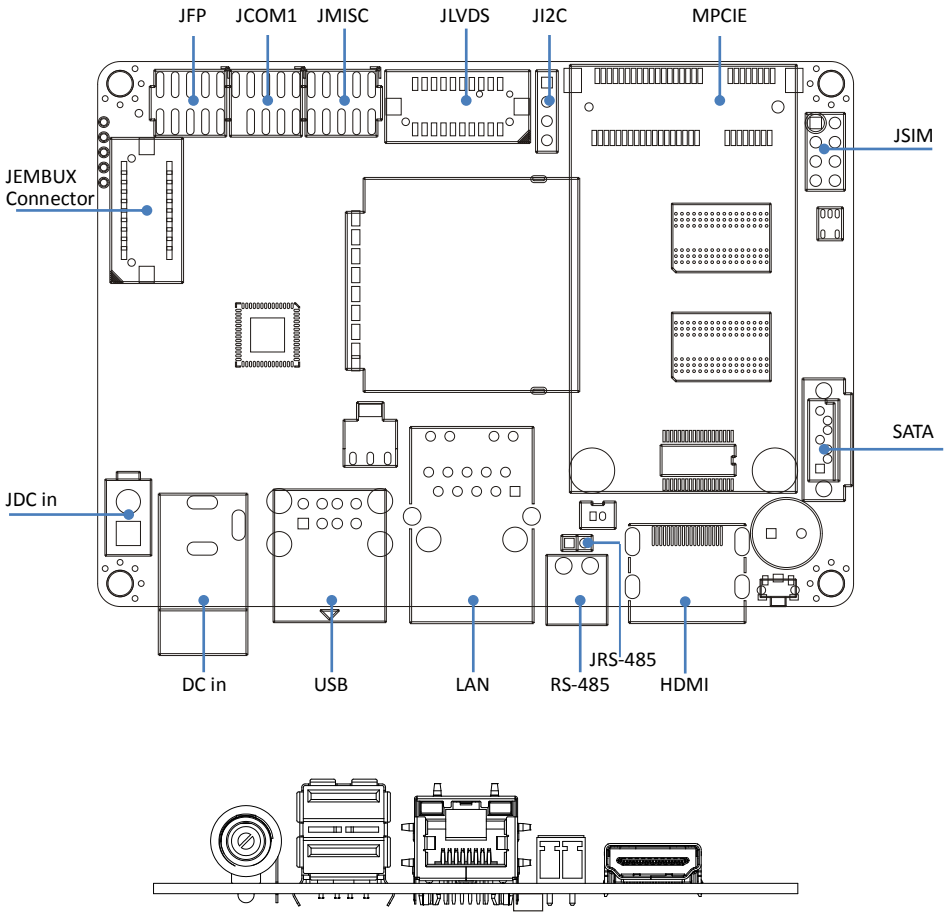
This chapter introduces the startup procedures of ICM-2010, including jumper setting and device integration. It also introduces the setting of switches, indicators and also shows the mechanical drawings. Be sure to real all safety precautions before you begin installation procedure.



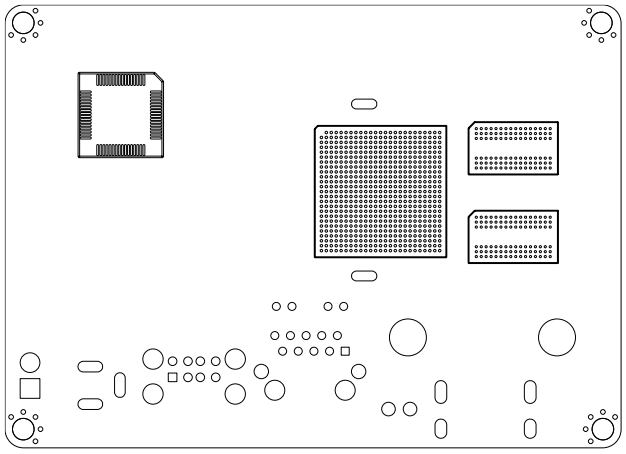
# 2. Hardware User Guide

## 2.1. Jumper and Connector Locations

### Top side:



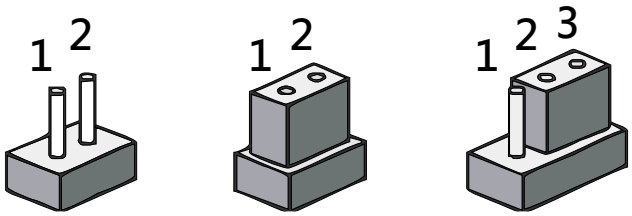

### Rear side:



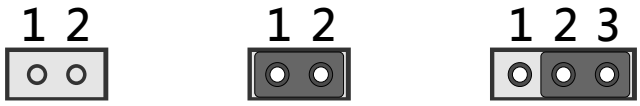
## 2.2. Jumper

### 2.2.1. Jumper Description

Cards can configured by setting jumpers. A jumper is a metal bridge used to close an electric circuit. It consists of two metal pins and a small metal clip (often protected by a plastic cover) that slides over the pins to connect them. To close a jumper, you connect the pins with the clip. To open a jumper, you remove the clip. Sometimes a jumper will have three pins, labeled 1, 2 and 3. In this case you would connect either pins 1 and 2 or 2 and 3.




The jumper settings are schematically depicted in this manual as follows.




A pair of needle-nose pliers may be helpful when working with jumpers. If you have any doubts about the best hardware configuration for your application, contact your local distributor or sales representative before you make any changes.

Generally, you simply need a standard cable to make most connections.

***Warning!***

*To avoid damaging the computer, always turn off the power supply before setting jumpers.*

### 2.2.2. Jumper List

### 2.2.3. Jumper Setting

## 2.3. Connector

### 2.3.1. Connector List

| | | |
|---|---|---|
| DC in | DC power input connector | DC power jack |
| RS-485 | RS-485 connector | 2 x 1 connector, pitch 3.5mm |
| HDMI | HDMI connector | |
| JCOM1 | RS-232 pin header | 5 x 2 header, pitch 2.0mm |
| JDC in | Power input pin header | 2 x 1 connector, pitch 4.2mm |
| JEMBUX | Proprietary connector | DF13-20DP-1-25V |
| JFP | Front panel connector | 5 x 2 header, pitch 2.0mm |
| JI2C | I2C connector | 4 x 1 header, pitch 2.54mm |
| JLVDS | LVDS connector | DF13-20DP-1-25V |
| JMISC | Miscellaneous connector | 5 x 2 header, pitch 2.0mm |
| JRS-485 | Reserved for X-Port connect | 2 x 1 header, pitch 2.0mm |
| JSIM | SIM connector + SATA PWR | 4 x 2 header, pitch 2.54mm |
| LAN | Ethernet connector | RJ-45 |
| MPCIE | Mini PCI Express connector | |
| SATA | SATA connector | |
| USB | USB connector | USB Type A |

### 2.3.2. Connector Setting

#### 2.3.2.1. RS-485

| Description | Pin |
|---|---|
| RS-485- | 1 |
| RS-485+ | 2 |

### 2.3.2.2. JCOM1

| Description | Pin | Pin | Description |
|---|---|---|---|
| N/C | 1 | 2 | RS-232_RX |
| RS-232_TX | 3 | 4 | N/C |
| GND | 5 | 6 | N/C |
| N/C | 7 | 8 | N/C |
| N/C | 9 | 10 | N/C |

### 2.3.2.3. JDC in

| Description | Pin |
|---|---|
| GND | 1 |
| 5V | 2 |

### 2.3.2.4. JEMBUX

| Description | Pin | Pin | Description |
|---|---|---|---|
| 3.3V | 2 | 1 | 5V |
| 3.3V | 4 | 3 | 5V |
| GPIO0 | 6 | 5 | GND |
| GPIO1 | 8 | 7 | MCU_SS |
| GPIO2 | 10 | 9 | MCU_CLK |
| GPIO3 | 12 | 11 | MCU_MOSI |
| GPIO4 | 14 | 13 | MCU_MISO |
| GPIO5 | 16 | 15 | GND |
| GPIO6 | 18 | 17 | I2C CLK |
| N/C | 20 | 19 | I2C DAT |

**Remark:**

GPIO pin control by MCU (level 3.3V)

MCU_SS: SPI Slave Select (active low, output from master)

MCU_CLK: SPI Serial Clock (output from master)

MCU_MOSI: SPI Master Output, Slave Input (output from master)

MCU_MISO: Master Input, Slave Output (output from slave)

### 2.3.2.5. JFP

| Description | Pin | Pin | Description |
|---|---|---|---|
| 5V | 1 | 2 | LED control by MCU |
| 5V | 3 | 4 | LED control by CPU |
| CPU power on | 5 | 6 | GND |
| GPIO7 | 7 | 8 | GND |
| GPIO8 | 9 | 10 | GND |

**Remark:**

GPIO pin control by MCU (level 3.3V)

### 2.3.2.6. JI2C

| Description | Pin |
|---|---|
| 3.3V | 1 |
| I2C_SCL | 2 |
| I2C_SDA | 3 |
| GND | 4 |

### 2.3.2.7. JLVDS

| Description | Pin | Pin | Description |
|---|---|---|---|
| 3.3V | 2 | 1 | 5V |
| 3.3V | 4 | 3 | 5V |
| Backlight EN (3.3V) | 6 | 5 | LVDS0_CLK- |
| Backlight CTL (3.3V) | 8 | 7 | LVDS0_CLK+ |
| GND | 10 | 9 | GND |
| LVDS0_TX1- | 12 | 11 | LVDS0_TX0- |
| LVDS0_TX1+ | 14 | 13 | LVDS0_TX0+ |
| GND | 16 | 15 | GND |
| LVDS0_TX3- | 18 | 17 | LVDS0_TX2- |
| LVDS0_TX3+ | 20 | 19 | LVDS0_TX2+ |

### 2.3.2.8. JMISC

| Description | Pin | Pin | Description |
|---|---|---|---|
| EMBUX X-Port RS-485 TX- | 1 | 2 | 5V |
| EMBUX X-Port RS-485 TX+ | 3 | 4 | USB D- |
| GND | 5 | 6 | USB D+ |
| CAN_H | 7 | 8 | GND |
| CAN_L | 9 | 10 | GND |

### 2.3.2.9. JRS-485

| Description | Pin |
|---|---|
| RS-485TX- | 1 |
| RS-485TX+ | 2 |

### 2.3.2.10. JSIM

| Description | Pin | Pin | Description |
|---|---|---|---|
| PCIe_UIM_PWR | 1 | 2 | PCIe_UIM_RST |
| PCIe_UIM_CLK | 3 | 4 | GND |
| PCIe_UIM_VPP | 5 | 6 | PCIe_UIM_DATA |
| 5V | 7 | 8 | GND |

**Remark:**

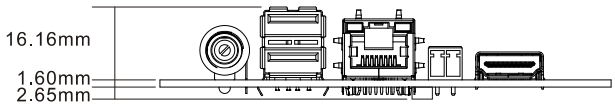
UIM: User Identity Module (UIM) Signals

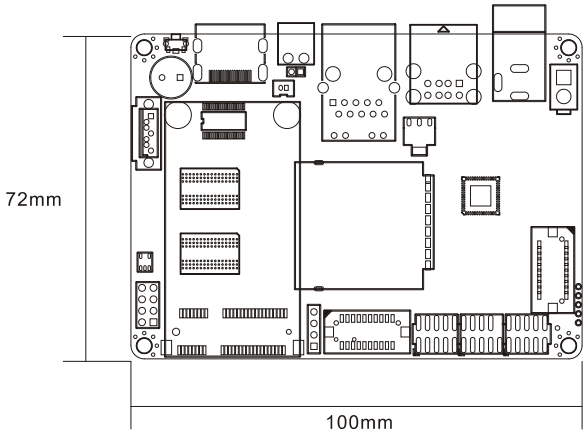
UIM_VPP: Variable supply voltage (e.g., programming voltage) for class A devices. This signal is reserved for future use for devices of other classes. Compliant to the ISO/IEC 7816-3 specification (VPP).

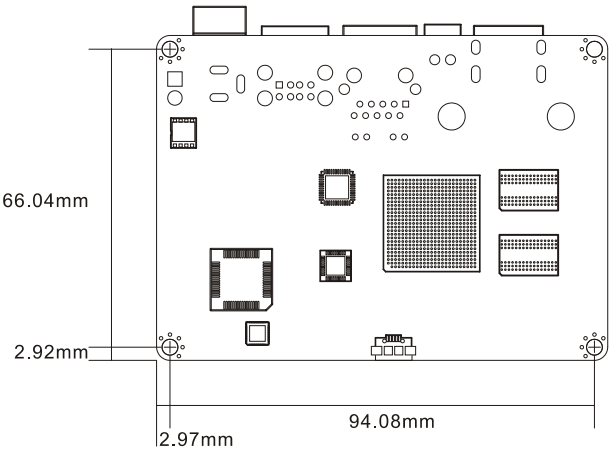
5V on pin 7 is reserved for SATA power

## 2.4. Mechanism

### 2.4.1. Board Dimension



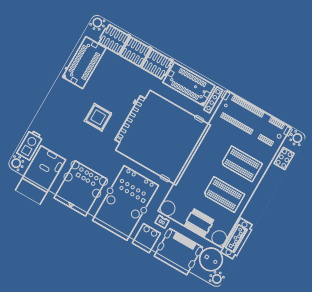



# Chapter 3

## Software User Guide

This chapter details the Linux operation on ICM-2010.



# 3. Software User Guide

## 3.1. Introduction

This chapter details the Linux operation on ICM-2010 platform. This platform is an embedded system with Linux kernel 3.0.35. It contains all system-required shell commands and drivers ready. You can evaluate and develop under Ubuntu 12.04 LTS environment.

There are three major boot components for Linux, “u-boot.bin”, “uImage” and “root file system”. The “u-boot.bin” is for initializing peripheral hardware parameters; the “uIm- age” is the Linux kernel image and the “File System” is for Linux O.S. used. It will not be able to boot into Linux environment successfully if one of above three files is missing from booting media (in ICM-2010, we use SD/MMC card)

## 3.2. Setup Build Environment

This section explains how to set up the build environment, install and build, and set up the host environment.

*Note: If you need, more detailed instructions can be found at L3.0.35_4.1.0_LINUX_DOCS in the file Setting_Up_LTIB_Host.pdf* (https://cache.freescale.com/secured/32bit/doc/support_info/L3.0.35_4.1.0_docs.tar.gz?__gda__=1428423300_12712125f6c749dde454e0f5d9b338d5&fileExt=.gz)

### 3.2.1. Installing and build

Follow the steps below to preparing the build environment. Entering the command without “$”.

# 0.1 pre-install

$ sudo apt-get install git u-boot-tools lzop

# 0.2 Cross Compiler As a result of the first two points, we now recommend these simple steps to install a cross-compiler:

$ sudo apt-get install gcc-arm-linux-gnueabihf

# check gcc version

$ arm-linux-gnueabihf-gcc -v

# 0.3 add export to .bashrc

export ARCH=arm
export CROSS_COMPILE=arm-linux-gnueabihf-

### 3.2.2. Download source code and checkout the latest version

# 1.1 u-boot source (u-boot-2009)

git clone https://github.com/embux/u-boot-imx.git u-boot-imx_2009
cd u-boot-imx_2009
git checkout imx_2009_ebx

# 1.2 Kernel source (imx_3.0.35)

$ git clone https://github.com/embux/linux-imx6.git
$ cd linux-imx6.git
$ git checkout imx_3.0.35_1.0.0_ebx

### 3.2.3. Build and Flashing the SD card

- u-boot

$make distclean
$make mx6dl_sabresd_config
$make

$ sudo dd if=u-boot.bin of=/dev/sdb bs=512 seek=2 skip=2 conv=fsync

- Kernel build and flash to SD Card (sdb, mounted /mnt)

$make clean
$make imx6_defconfig
$make -j4 uImage

## 3.3. Create SD/MMC Card using Linux Host

### 3.3.1. Requirements

An SD/MMC card reader, like a USB card reader, is required. It will be used to transfer the boot loader and kernel images to initialize the partition table and copy the root file system. To simplify the instructions, it is assumed that a 4GB SD/MMC card is used.

Any Linux distribution can be used for the following procedure. It is recommended to use a Linux distribution that LTIB has been tested against such as Ubuntu 9.04.

The Linux kernel running on the Linux host will assign a device node to the SD/MMC card reader. The kernel might decide the device node name or udev rules might be used. In the following instructions, it is assumed that udev is not used.

To identify the device node assigned to the SD/MMC card, enter the command:

```
$ cat /proc/partitions
major  minor  #blocks name
   8       0 175825944  sda
   8       1    254976  sda
   8       2         1  sda
   8       5 175567872  sda
   8       0    7761920 sdb
   8       0    2048000 sdb
```

In this example, the device node assigned is /dev/sdb (a block is 512B large).

Download the u-boot & Kernel Images for ICM-2010 SD card image: go to https://github.com/embux/ , and choose the right image for your platform (in this case: ICM-2010-images.tar.gz). Extract the file for preparing the SD/MMC images download.

### 3.3.2. Copying the Boot loader Image

Enter the following command to copy the U-Boot image to the SD/MMC card:

$ sudo dd if=u-boot.bin  of=/dev/sdb bs=512 seek=2 skip=2 conv=fsync

This assumes a pre-built U-Boot image delivered with the BSP or built from the U-Boot source code. If using a non-padded U-Boot image, "skip=2" should be omitted from the above command line. The first 1 KB of the SD/MMC card, that includes the partition table, will be preserved.

### 3.3.3. Copying the Kernel Image

The following command will copy the kernel image to the SD/MMC card:

$ sudo dd if=uImage of=/dev/sdb bs=512 seek=2048 conv=fsync
This will copy uImage to the media at offset 1 MB (bs x seek = 512 x 2048 = 1MB).

### 3.3.4. Copying the Root File System (rootfs)

First, a partition table must be created. If a partition already exists and it is big enough for the file system you want to deploy, then you can skip this step.

To create a partition, at offset 16384 (in sectors of 512 bytes) enter the following command:

$ sudo fdisk /dev/sdb
Note: On most Linux host operating systems, SD card will be mounted automatically upon insertion. Therefore, before running fdisk, please make sure that SD card is unmounted (via 'sudo umount /dev/sdb').

Type the following parameters (each followed by <ENTER>):

u [switch the unit to sectors instead of cylinders]
d [repeat this until no partition is reported by the ‘p’ command ]
n [create a new partition]
p [create a primary partition]
1 [the firs partition]
16384 [start at offset sector #16384, i.e. 8MB, which leaves enough space for the kernel, the boot loader and its configuration data]
<enter> [using the default value will create a partition that spans to the last sector of the medium]
w [this writes the partition table to the medium and fdisk exits]
The file system format ext3 or ext4 is a good option for removable media due to the built- in journaling. Run the following command to format the partition:

$ sudo mkfs.ext3 /dev/sdb1
Or
$ sudo mkfs.ext4 /dev/sdb1
Copy the target file system to the partition:

$ mkdir /home/user/mountpoint
$ sudo mount /dev/sdb1 /home/user/mountpoint

Download and save the demo rootfs from https://releases.linaro.org/12.04/ubuntu/precise-images/ubuntu-desktop/linaro-precise-ubuntu-desktop-20120426-119.tar.gz

Extract rootfs package to certain directory: extract rootfs.ext2.gz to /home/user/rootfs for example:

$ gunzip rootfs.ext2.gz
$ mount -o loop -t ext2 rootfs.ext2 /home/user/rootfs
Assume that the root file system files are located in /home/user/rootfs as in the previous step:

$ cd /home/user/rootfs
$ sudo cp -a * /home/user/mountpoint
$ sudo umount /home/user/mountpoint
$ sync

The file system content is now on the media.

## 3.4. Applications and Testing

### 3.4.1. Ethernet Test

A simple ping test. You can increase the size of the packet press -s switch

# ping -s 500 192.168.0.100
PING 192.168.0.100 (192.168.0.100): 1000 data bytes
1008 bytes from 192.168.0.100: seq=0 ttl=64 time=1.980 ms
1008 bytes from 192.168.0.100: seq=1 ttl=64 time=0.459 ms
1008 bytes from 192.168.0.100: seq=2 ttl=64 time=0.461 ms
1008 bytes from 192.168.0.100: seq=3 ttl=64 time=0.475 ms

--- 192.168.0.100 ping statistics ---

4 packets transmitted, 4 packets received, 0% packet loss

…

### 3.4.2. USB

Plug in a USB memory stick, you will see a message like this (possible use dmesg command to see how your USB is detected).

# usb 1-1.1: device v17ef p3818 is not supported
sd 1:0:0:0: [sdc] No Caching mode page present
sd 1:0:0:0: [sdc] Assuming drive cache: write through
sd 1:0:0:0: [sdc] No Caching mode page present
sd 1:0:0:0: [sdc] Assuming drive cache: write through
sd 1:0:0:0: [sdc] No Caching mode page present
sd 1:0:0:0: [sdc] Assuming drive cache: write through

Mount the USB (in this example the USB is formatted as FAT)

# mount /dev/sdc1 /media
# ls -la /media

Now, you can copy a video to /media and play it. This will perform a simple USB test.

### 3.4.3. SD

Plug the SD card and find out where the card is mapped. After typing dmesg at you will see something like this:

# dmesg | tail
mmc0: new high speed SD card at address aaaa
mmcblk1: mmc0:aaaa SU02G 7.8 GiB
mmcblk1: p1

Your card is mapped in /dev/mmcblk0.

### 3.4.4. I2C

# *sudo apt-get* install i2c-tool
# i2cdetect 1
WARNING! This program can confuse your I2C bus, cause data loss and worse!
I will probe file /dev/i2c-1. I will probe address range 0x03-0x77. Continue? [Y/n] y

```
     0 1 2 3 4 5 6 7 8 9 a b c d e f
00: -- -- -- -- -- -- -- -- -- -- -- --
10: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
```

20: -- -- -- -- -- -- -- 27 -- -- -- -- -- -- -- --

30: 30 -- -- -- -- -- -- 37 -- -- -- -- -- -- -- --

40: -- -- -- -- -- -- -- -- 48 -- 4a 4b -- -- -- --

50: UU 51 -- -- -- -- -- -- -- -- -- -- -- -- -- --

60: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --

70: -- -- -- -- -- -- -- -- # [/code]

## 3.5. Create a Virtual Machine Environment

### 3.5.1. Introduction

The use of a virtual machine running a specific Linux Ubuntu distribution is highly recommended. A virtual machine will create a dedicated, close environment that will ensure that a step-by-step procedure will guide the user until the end without problems.It also prevent risks ofsystem corruption or that compiling environment is not clean It also allows to be sure that used libraries are always the same, and updated.

System Requirements  To run the procedure described in the following sections, it is necessary to have: PC with virtual machine running Linux Ubuntu 10.04 with at least 40 GB of free disk space.

This procedure can be performed also on native Linux OS. The use of a VM only reduces system differences and can follow a standard procedure to compile.

### 3.5.2. Setting up work environment

*Install the Virtual Machine*

VMware PlayerTM is recommended for this operation. A step-by-step installation Procedure is provided.

Download the VM player  Download the player from VMware Player website:

You can find the latest st version at http://www.vmware.com/products/player/ . Choose the version dedicated to the OS used.

Install the VM on your system  Open the installer and follow the instructions.

For more information, check the VMware documentation:

http://www.vmware.com/pdf/VMwarePlayerManual10.pdf

Download Ubuntu disk image A 64 bit 10.04 Ubuntu distro to run this procedure is recommended. It can be downloaded from http://old-releases.ubuntu.com/releases/lucid/

Create a new VM running Ubuntu 10.04 Click on VMware Player icon.

Choose “Create a New Virtual Machine” from menu on the right Choose “Installer disk image file (iso)” and select the downloaded ubuntu iso image.. Press Next button. Then choose your name, the username and the password. Fill these fields and click on next button. Choose the VM name: EA21-10.04 and click next. Set harddisk size at least 20 GB. Select “split virtual disk into multiple files” option. Now it is necessary to set VM performances by clicking on “customize hardware” button.

Memory Options:

- 2 GB minimum (memory swapping especially during java compiling)

- 4 GB+ perfect (no memory swapping during build operations)

Attention

The memory size must be chosen according to the amount of free memory on the host computer. When large amount of memory are assigned to VM, then the host OS could repeatedly swap or page, leading to a drastic decrease of computer’ s performances.

CPUs: All the available CPU cores of the host PC should be assigned to VM execution, especially for the first compiling which requires a lot of time. After the first phase, it is possible to reduce the number of CPU cores, if desired.

Then click on “Finish” button and Ubuntu installation will start. When the installation has ended, it is possible that it is necessary to login from console and launch the GUI by running the command:

```
startx
```

# Setting up VM environment

Update the system:

$ sudo apt-get update

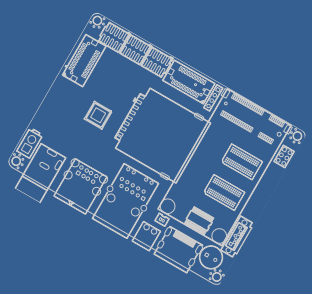
Install required libraries for compiling process:

$ sudo apt-get install git-core gnupg flex bison gperf build-essential \
zip curl zlib1g-dev libc6-dev lib32ncurses5-dev ia32-libs \ x11proto-core-dev libx11-dev lib32readline5-dev lib32z-dev \ libgl1-mesa-dev g++-multilib mingw32 tofrodos python-markdown \ libxml2-utils xsltproc uuid-dev liblzo2-dev

# Chapter 4

## System Recovery

This chapter introduces how to recover Linux operating system if it is damaged accordingly.



# 4. System Recovery

This chapter describes the steps to create an new SD/MMC card to boot up an ICM-2010 board. When things go wrong, we could take this SD/MMC card as the backup or the new system to start.

## 4.1. Download the SD image

Downloaded the SD card image: go to https://github.com/embux/ , and choose the right image for your platform (in this case: ICM-2010_Ubuntu), in Readme.md part, you will find the link for “The Linux Ubuntu12 SD Card Image for ICM-2010 download from Google Driver”, just click on it and it will start download immediately. Once download has finished, you’ll have a .xz file (ex: ea2mx6dl-ubuntu12-full.img.xz ).

## 4.2. Write an SD/MMC Card using Linux (Ubuntu)

- From the terminal run *df -h.*
- Connect the SD card reader with the SD card inside.
- Run *df -h* again and look for the new device that wasn't listed last time. Record the device name of the filesystem's partition, for example: */dev/sdc1.*
- Unmount the partition so that you will be allowed to overwrite the disk:

  *sudo unmount /dev/sdc1*

- Decompressed the xz file which download in sec 4.1

*$ xz –d* ubuntu12-full.img.xz

- In the terminal, write the image to the card with this command, using the disk device name from above. Read the above step carefully to be sure you use the correct disk number here: (This will take a few minutes)

*$ sudo dd if=<image_path>/ubuntu12-full.img of=/dev/sdc bs=8M conv=fsync*

## 4.3. Write an SD/MMC Card using Windows

### 4.3.1. Introduction

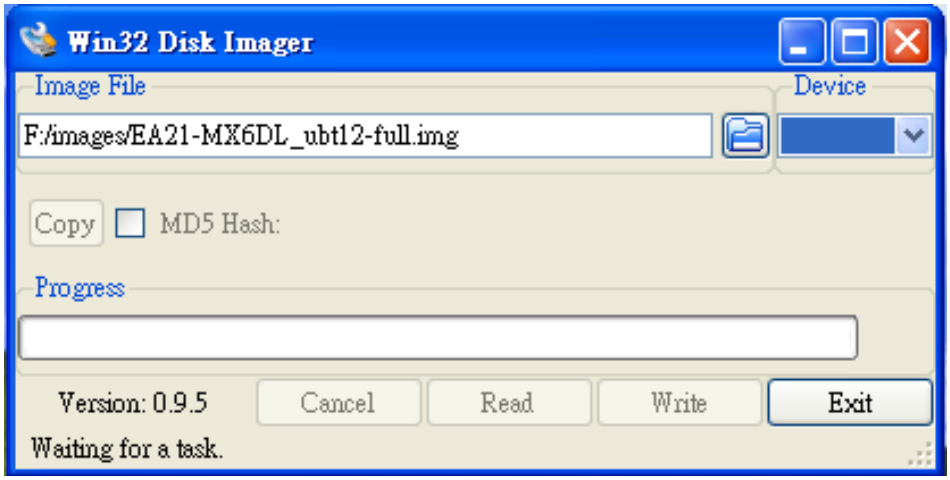
This guide describes the process of writing these images to a SD-Card on a Windows PC (under Linux you would use the *dd* command).

### 4.3.2. Preparations

- Download the SD-Card image which described in Chap 4.1.
- The downloaded file is in the xz file format and needs to be uncompressed. xz utility (http://tukaani.org/xz/) can be used if no suitable application is installed on your computer
- Make sure that your target SD-Card is big enough to contain this file (8G recommend )
- Download and unzip Image Writer for Windows (http://sourceforge.net/projects/win32diskimager/files/)

### 4.3.3. Create SD-Card

- Insert the SD-Card into your computer and check which drive letter it got assigned
- Open Win32DiskImager.exe
    - Click the *FileOpen* Icon and select the unzipped .bin file
    - Select the letter of your SD-Card in the device drop-down menu
    - **Double check if you have chosen the right drive!** You may damage your PC or data otherwise.




- Press write to start writing the image to the card. (This may take a couple of minutes)
- After the Program is finished, you can eject your SD-Card.
- Insert it into your target device, plug-in power cable and you could start using the device

## 4.4. Write an SD/MMC Card using MAC OS X

On Mac OS we could use the command line *dd* tool or using the graphical tool ImageWriter to write the image to the SD/MMC card.

### 4.4.1. graphical interface

- Connect the SD card reader with the SD card inside. Note that it must be formatted in FAT32.
- From the Apple menu, choose About This Mac, then click on More info...; if you are using Mac OS X 10.8.x Mountain Lion or newer then click on System Report.
- Click on USB (or Card Reader if using a built-in SD card reader) then search for your SD card in the upper right section of the window. Click on it, then search for the BSD name in the lower right section; it will look something like 'diskn' where n is a number (for example, disk4). Make sure you take a note of this number.
- Unmount the partition so that you will be allowed to overwrite the disk; to do this, open Disk Utility and unmount it (do not eject it, or you will have to reconnect it). Note that On Mac OS X 10.8.x Mountain Lion, "Verify Disk"

(before unmounting) will display the BSD name as "/dev/disk1s1" or similar, allowing you to skip the previous two steps.

- From the terminal run:

```
sudo dd bs=1m if=<image_path>/ubuntu12-full-image.img
of=/dev/diskn
```

Remember to replace `n` with the number that you noted before!

### 4.4.2. Command line

- If you are comfortable with the command line, you can image a card without any additional software. Run:

```
diskutil list
```

- Identify the disk (not partition) of your SD card e.g. `disk4` (not `disk4s1`):

```
diskutil unmountDisk /dev/<disk# from diskutil>
```

e.g. `diskutil unmountDisk /dev/disk4`

```
sudo dd bs=1m if=image.img of=/dev/<disk# from diskutil>
```

e.g. `sudo dd bs=1m if=2015-02-16-raspbian-wheezy.img of=/dev/disk4`

This may result in an `dd: invalid number '1m'` error if you have GNU coreutils installed. In that case you need to use `1M`:

```
sudo dd bs=1M if=image.img of=/dev/<disk# from diskutil>
```

This will take a few minutes.

### 4.4.3. Alternative method

Note: Some users have reported issues with using Mac OS X to create SD cards.

These commands and actions need to be performed from an account that has administrator privileges.

- From the terminal run `df -h`.

- Connect the SD card reader with the SD card inside.
- Run `df -h` again and look for the new device that wasn't listed last time. Record the device name of the filesystem's partition, for example `/dev/disk3s1`.
- Unmount the partition so that you will be allowed to overwrite the disk:

  ```
  sudo diskutil unmount /dev/disk3s1
  ```

  (or open Disk Utility and unmount the partition of the SD card (do not eject it, or you will have to reconnect it)

- Using the device name of the partition, work out the raw device name for the entire disk by omitting the final "s1" and replacing "disk" with "rdisk". This is very important as you will lose all data on the hard drive if you provide the wrong device name. Make sure the device name is the name of the whole SD card as described above, not just a partition of it (for example, rdisk3, not rdisk3s1). Similarly, you might have another SD drive name/number like rdisk2 or rdisk4; you can check again by using the `df -h` command both before and after you insert your SD card reader into your Mac. For example, `/dev/disk3s1` becomes `/dev/rdisk3`.
- In the terminal, write the image to the card with this command, using the raw disk device name from above. Read the above step carefully to be sure you use the correct rdisk number here:

  ```
  sudo dd bs=1m if=2015-02-16-raspbian-wheezy.img of=/dev/rdisk3
  ```

  If the above command reports an error (`dd: bs: illegal numeric value`), please change `bs=1m` to `bs=1M`.

  If the above command reports an error `dd: /dev/rdisk3: Permission denied` then that is because the partition table of the SD card is being protected against being overwritten by MacOS. Erase the SD card's partition table using this command:

  ```
  sudo diskutil partitionDisk /dev/disk3 1 MBR "Free Space"
  "%noformat%" 100%
  ```

  That command will also set the permissions on the device to allow writing. Now try the `dd` command again.

Note that `dd` will not feedback any information until there is an error or it is finished; information will be shown and the disk will re-mount when complete. However if you wish to view the progress you can use 'ctrl-T'; this generates SIGINFO, the status argument of your tty, and will display information on the process.

- After the `dd` command finishes, eject the card:

  ```
  sudo diskutil eject /dev/rdisk3
  ```

  (or: open Disk Utility and eject the SD card)